ANSI A300-1995

American National Standard

for Tree Care Operations –

Tree, Shrub and Other Woody Plant Maintenance – Standard Practices

ANSI American National Standards Institute
11 West 42nd Street
New York, New York
10036

ANSI®
A300-1995

American National Standard
for Tree Care Operations –

Tree, Shrub and Other Woody Plant Maintenance – Standard Practices

Secretariat
National Arborist Association, Inc.

Approved June 1, 1995
American National Standards Institute, Inc.

American National Standard

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Published by

American National Standards Institute
11 West 42nd Street, New York, New York 10036

Printed in the United States of America

APS10M795/18

Contents

Foreword (This foreword is not part of American National Standard A300-1995.)

This standard was developed under the procedures of the American National Standards Institute by Accredited Standards Committee on Tree, Shrub and Other Woody Plant Maintenance Operations, A300. The National Arborist Association is the secretariat of A300.

Accredited Standards Committee A300 was approved June 28, 1991. The Committee was organized to develop a consensus performance standard for persons engaged in the maintenance of trees, shrubs and other woody plants. The Committee includes representatives from the residential and commercial tree care industry; the utility, municipal, and federal sectors; the landscape and nursery industries; as well as other interested organizations.

The A300 standard currently addresses tree pruning practices only. Subcommittees have been formed to address Construction Protection; Cabling, Bracing, and Guying; Soil Modification/Fertilization; Lightning Protection; Equipment Calibration; Tree Growth Regulators; and Shrub, Vine, and Other Woody Plant Pruning.

Specifications for tree work should be written and administered by an arborist. An arborist is a professional who possesses the technical competence through experience and related training to provide for or supervise the management of trees and other woody plants in the residential, commercial, and public landscape. This A300 standard offers basic performance standards. It is not a guideline to illustrate how to prune trees.

This standard has been drafted to address pruning specification requirements across all geographic areas. The users of this standard must interpret the wording based on their knowledge of the growth habits of certain tree species within a given environment.

Suggestions for improvement of this standard should be forwarded to: A300 Secretariat, c/o National Arborist Association, P.O. Box 1094, Amherst, NH 03031.

This standard was processed and approved for submittal to ANSI by Accredited Standards Committee on Tree, Shrub and Other Woody Plant Maintenance Operations, A300. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the A300 committee had the following members:

Tim Johnson, Chairman
(Artistic Arborist, Inc.)
Brian Barnard, Secretary
(National Arborist Association)

Organization Represented	*Name of Representative*
American Association of Nurserymen	Craig J. Regelbrugge
	Ben Bolusky (Alt.)
American Forests	Cheryl Kollin
American Society of Consulting Arborists	Donald F. Blair
American Society of Landscape Architects	Karen Niles
Asplundh Tree Expert Company	James D. Beam
	Dave Morrison (Alt.)
Associated Landscape Contractors of America	Preston Leyshon

Organization Represented	*Name of Representative*
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	Karl Warnke (Alt.)
The F.A. Bartlett Tree Expert Company	Greg Daniels
International Society of Arboriculture	John C. Britton
	Bill Kruidenier (Alt.)
Municipal Arborists & Urban Foresters Society	Cathy Riley-Hall
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U.S. Forest Service	Rita Schoeneman
	Marcia Sneed (Alt.)
Utility Arborist Association	Jeff Smith
	Mike Watson (Alt.)

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Tree, Shrub and Other Woody Plant Maintenance – Standard Practices

1 Scope, purpose, and application

1.1 Scope

This document presents performance standards for the care and maintenance of trees, shrubs, and other woody plants.

1.2 Purpose

It is intended as a guide for federal, state, municipal, and private authorities including property owners, property managers, and utilities in the drafting of their maintenance specifications and should be adopted by them in whole or in part.

1.3 Application

This standard is intended to apply to any person or entity engaged in the business, trade, or performance of repairing, maintaining, or preserving trees.

1.4 Implementation

Specifications for tree work should be written and administered by an arborist.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

ANSI Z60.1-1990, *Nursery stock*

ANSI Z133.1-1994, *Tree care operations – Pruning, trimming, repairing, maintaining, and removing trees, and cutting brush – Safety requirements*

29 CFR 1910, *General industry*[1)]

29 CFR 1910.268, *Telecommunications*[1)]

29 CFR 1910.269, *Electric power generation, transmission, and distribution*[1)]

29 CFR 1910.331 – 335, *Electrical safety-related work practices*[1)]

3 Definitions

3.1 anvil-type pruning tool: Pruning tool that has a straight sharp blade that cuts against a flat metal cutting surface. (See *hook and blade-type pruning tool.*)

3.2 arborist: A professional who possesses the technical competence through experience and related training to provide for or supervise the management of trees and other woody plants in the residential, commercial, and public landscape.

3.3 boundary reaction zone: A separating boundary between wood present at the time of wounding and wood that continues to form after wounding.

3.4 branch: A secondary shoot or stem arising from one of the main axes (i.e., trunk or leader) of a tree or woody plant.

[1)] Available from U.S. Department of Labor, 200 Constitution Avenue, NW, Washington, DC 20210.

3.5 branch collar: Trunk tissue that forms around the base of a branch between the main stem and the branch or a branch and a lateral. As a branch decreases in vigor or begins to die, the branch collar becomes more pronounced.

3.6 branch bark ridge: Raised area of bark in the branch crotch that marks where the branch wood and trunk wood meet.

3.7 callus: Undifferentiated tissue formed by the cambium layer around a wound.

3.8 cambium: Dividing layer of cells that forms sapwood (xylem) to the inside and bark (phloem) to the outside.

3.9 climbing spurs: Sharp, pointed devices affixed to the climber's leg used to assist in climbing trees (also known as *gaffs, hooks, spurs, spikes, climbers*).

3.10 closure: The process of woundwood covering a cut or other tree injury.

3.11 crotch: The angle formed at the attachment between a branch and another branch, leader, or trunk of a woody plant.

3.12 crown: The leaves and branches of a tree or shrub; the upper portion of a tree from the lowest branch on the trunk to the top.

3.13 crown cleaning: The removal of dead, dying, diseased, crowded, weakly attached, low-vigor branches, and watersprouts from a tree's crown.

3.14 crown raising: The removal of the lower branches of a tree in order to provide clearance.

3.15 crown reduction: The reduction of the top, sides, or individual limbs by the means of removal of the leader or longest portion of a limb to a lateral no less than one-third of the total diameter of the original limb removing no more than one-quarter of the leaf surface.

3.16 crown thinning: The selective removal of branches to increase light penetration and air movement, and to reduce weight.

3.17 cut: The exposed wood area resulting from the removal of a branch or portion thereof.

3.18 decay: Degradation of woody tissue caused by biological organisms.

3.19 espalier pruning: A combination of cutting and training branches that are oriented in one plane, formally or informally arranged, and usually supported on a wall, fence, or trellis. The patterns can be simple or complex, but the cutting and training is precise. Ties should be replaced every few years to prevent girdling the branches at the attachment site.

3.20 facility: Equipment or structure used to deliver or provide protection for the delivery of an essential service such as electricity.

3.21 girdling roots: Roots located above- or belowground whose circular growth around the base of the trunk or over individual roots applies pressure to the bark area, ultimately restricting sap flow and trunk/root growth, frequently resulting in reduced vitality or stability of the plant.

3.22 heading: Cutting a currently growing or one-year-old shoot back to a bud, or cutting an older branch or stem back to a stub or lateral branch not sufficiently large enough to assume the terminal role. Heading should rarely be used on mature trees.

3.23 heartwood: The inactive xylem (wood) toward the center of a stem or root that provides structural support.

3.24 hook and blade pruning tool: A hand pruner that has a curved, sharpened blade that overlaps a supporting hook; in contrast to an *anvil-type pruning tool.*

3.25 horizontal plane (palms): An imaginary level line that begins at the base of live frond petioles.

3.26 lateral: A branch or twig growing from a parent branch or stem.

3.27 leader: A dominant upright stem, usually the main trunk. There can be several leaders in one tree.

3.28 limb: Same as *branch*, but larger and more prominent.

3.29 lopping: See *heading.*

3.30 mycelium: Growth mass of fungus tissue found under bark or in rotted wood.

3.31 obstructing: To hinder, block, close off, or be in the way of; to hinder or retard a desired effect or shape.

3.32 parent branch or stem: The tree trunk; or a large limb from which lateral branches grow.

3.33 petiole: The stalk of a leaf.

3.34 phloem: Inner bark tissue through which primarily carbohydrates and other organic compounds move from regions of high concentration to low.

3.35 pollarding: Pollarding is a training system used on some large-growing deciduous trees that are severely headed annually or every few years to hold them to modest size or to give them and the landscape a formal appearance. Pollarding is not synonymous with topping, lopping, or stubbing. Pollarding is severely heading some and removing the other vigorous water sprouts back to a definite head or knob of latent buds at the branch ends.

3.36 precut or precutting: The two-step process to remove a branch before the finished cut is made so as to prevent splitting or bark tearing into the parent stem. The branch is first undercut, then cut from the top before the final cut.

3.37 pruning: Removal of plant parts.

3.38 qualified line clearance tree trimmer: A tree worker who, through related training and on-the-job experience is familiar with the techniques in line clearance and has demonstrated his/her ability in the performance of the special techniques involved. This qualified person may or may not be currently employed by a line clearance contractor.

3.39 qualified line clearance tree trimmer trainee: Any worker undergoing line-clearance tree trimming training, who, in the course of such training, is familiar with the techniques in line clearance and has demonstrated his/her ability in the performance of the special techniques involved. Such trainees shall be under the direct supervision of qualified personnel.

3.40 qualified person or personnel: Workers who, through related training, or on-the-job experience, or both, are familiar with the techniques and hazards of arboriculture work including training, trimming, maintaining, repairing, or removing trees, and the equipment used in such operations.

3.41 qualified tree worker, person, or personnel: A person(s) who, through related training and on-the-job experience, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees and with the equipment used in such operations, and has demonstrated ability in the performance of the special techniques involved.

3.42 qualified tree worker trainee: Any worker undergoing on-the-job training who, in the course of such training, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees, with the equipment used in such operations, and has demonstrated ability in the performance of the special techniques involved. Such trainees shall be under the direct supervision of qualified personnel.

3.43 remote/rural: Areas associated with very little human activity, land improvement, or development.

3.44 sapwood: The active xylem (wood) that stores water and carbohydrates, and transports water and nutrients; a wood layer of variable thickness found immediately inside the cambium, comprised of water-conducting vessels or tracheids and living plant cells.

3.45 shall: As used in this standard, denotes a mandatory requirement.

3.46 should: As used in this standard, denotes an advisory recommendation.

3.47 stub: An undesirable short length of a branch remaining after a break or incorrect pruning cut is made.

3.48 stubbing: See *heading*.

3.49 target: A person, structure, or object that could sustain damage from the failure of a tree or portion of a tree.

3.50 terminal role: Branch that assumes the dominant vertical position on the top of a tree.

3.51 thinning: The removal of a lateral branch at its point of origin or the shortening of a branch or stem by cutting to a lateral large enough to assume the terminal role.

3.52 throwline: A small, lightweight line with a weighted end used to position a climber's rope in a tree.

3.53 topping: See *heading*.

3.54 tracing: Shaping a wound by removing loose bark from in and around a wound.

3.55 urban/residential: Locations normally associated with human activity such as populated areas including public and private property.

3.56 utility: An entity that delivers a public service such as electricity or communication.

3.57 utility space: The physical area occupied by the utility's facilities and the additional space required to ensure its operation.

3.58 wound: The opening that is created any time the tree's protective bark covering is penetrated, cut, or removed, injuring or destroying living tissue. Pruning a live branch creates a wound, even when the cut is properly made.

3.59 woundwood: Differentiated woody tissue that forms after initial callus has formed around the margins of a wound. Wounds are closed primarily by woundwood.

3.60 xylem: Wood tissue; active xylem is called *sapwood*, inactive xylem is called *heartwood*.

3.61 young tree: A tree young in age or a newly installed tree.

4 Safety

4.1 Tree maintenance shall only be performed by qualified tree workers, who through related training, or on-the-job experience, or both, are familiar with the practices and hazards of arboriculture, and the equipment used in such operations.

4.2 This standard shall not take precedence over arboricultural safe work practices.

Operations shall comply with applicable Occupational Safety and Health Administration (OSHA) standards (see clause 2), ANSI Z133.1, as well as state and local regulations.

5 Tree pruning

5.1 Purpose

The purpose of this clause is to provide specifications for tree pruning.

5.2 Pruning practices

5.2.1 Reasons for pruning

The reasons for tree pruning may include, but are not limited to, reducing hazards, maintaining or improving tree health and structure, improving aesthetics, or satisfying a specific need such as: removing diseased, dead, dying, decayed; interfering or obstructing branches; training young trees; utility line clearance; or specialty tasks as defined in this standard. Before pruning, the primary objective should be clearly defined. That objective should be accomplished in the manner most beneficial to the health of the tree.

Pruning practices for agricultural, horticultural production or silvicultural purposes are exempt from this standard.

5.2.2 When to prune

To obtain the defined objective, the growth cycles of individual species as well as the type of pruning to be performed should be considered.

5.2.3 Tree inspection

Before beginning work and while work is being performed, a qualified person shall visually inspect each tree. If a condition is observed that requires additional attention, this condition should be brought to the attention of an immediate supervisor or the person responsible for authorizing the work.

5.2.4 Tools and equipment

5.2.4.1 Pruning tools used in making pruning cuts shall be kept adequately sharpened to result in final cuts with a smooth surface and firmly attached remaining adjacent bark.

5.2.4.2 Hook and blade pruning tools should be used; not anvil-type pruning tools.

5.2.4.3 Climbing spurs should not be used when climbing trees, except as specified elsewhere in this standard. Climbing spur use is permissible on tree removals and in emergencies such as aerial rescue.

5.2.4.4 Equipment and work practices that damage bark, cambium, live palm tissue, or any combination of these, should be avoided.

5.2.5 Pruning cuts

5.2.5.1 A thinning cut should be the preferred type of cut to make.

5.2.5.2 A thinning cut shall consist of the removal of a lateral branch at its point of origin or the shortening of a branch or stem by cutting to a lateral large enough to assume the terminal role.

5.2.5.3 A heading cut should rarely be used on mature trees, yet may be appropriate for

specific purposes such as, but not limited to, training young trees; pollarding, shaping terminal flowering trees, storm damage repair, etc.

5.2.5.4 A heading cut should consist of cutting a currently growing or one-year-old shoot back to a bud, or cutting an older branch or stem back to a stub or lateral branch not sufficiently large enough to assume the terminal role.

5.2.5.5 When removing a lateral branch at its point of origin on the trunk or parent limb, the final cut shall be made in branch tissue close to the trunk or parent limb, without cutting into the branch bark ridge or collar, or leaving a stub. (See figure 1.)

5.2.5.6 When removing a leader or length of a branch, the angle of the cut should bisect the angle between the branch bark ridge and an imaginary line perpendicular to the leader being removed. (See figure 2.)

5.2.5.7 When removing a dead branch, the final cut shall be made just outside the collar of live tissue. If the collar has grown out along the branch stub, only the dead stub should be removed. The live collar shall remain intact and uninjured.

5.2.5.8 To prevent damage to the parent limb when removing a branch with a narrow branch attachment, the final cut should be made from the bottom of the branch up. (See figure 3.)

5.2.5.9 Cut limbs shall be removed from the crown upon completion of the pruning, or at times when the tree would be left unattended or at the end of the work day.

5.2.6 Wound treatment

5.2.6.1 Wound dressings and tree paints should not be used to cover pruning wounds, except when specified for disease, borer, mistletoe, sprout control, or cosmetic reasons. If wound dressings or paints are used for cosmetic or other reasons, then materials nontoxic to the cambium layer shall be used, and only a light coating shall be applied to the wound surface.

5.2.6.2 When repairing bark wounds, only damaged or loose bark should be removed, disturbing a minimal amount of live tissue.

5.2.6.3 Cavities shall not be filled or treated if the boundary reaction zones would be disturbed.

5.3 Mature tree pruning

5.3.1 General

The following specifications should be used with pruning objectives.

5.3.1.1 Pruning cuts shall be made in accordance with 5.2.5.

5.3.1.2 Tree branches shall be removed in such a manner so as not to cause damage to other parts of the tree or to other plants or property. Branches too large to support with one hand shall be precut to avoid splitting or tearing of the bark. (See figure 1.) Where necessary, ropes or other equipment should be used to lower large branches or portions of branches to the ground.

5.3.1.3 When a branch is cut back to a lateral, not more than one-fourth of its leaf surface should be removed. The lateral remaining should be large enough to assume the terminal role.

5.3.1.4 Not more than one-fourth of the foliage on a mature tree should be removed within a growing season.

5.3.1.5 Upon completion of pruning a mature tree, one-half of the foliage should remain evenly distributed in the lower two-thirds of the crown and individual limbs.

5.3.2 Size specifications

A minimum or maximum diameter of branches to be removed should be specified to establish the extent of pruning, such as: the removal of branches 3 in (7.5 cm) in diameter and greater, or; the removal of branches 2 in (5 cm) in diameter and greater, etc.

5.3.3 Pruning objectives

Pruning objectives should be established prior to beginning any pruning operation.

5.3.3.1 Hazard reduction pruning

Hazard reduction pruning is recommended when the primary objective is to reduce the danger to a specific target caused by visibly defined hazards in a tree. Hazard reduction pruning should consist of one or more of the maintenance pruning types.

5.3.3.2 Maintenance pruning

Maintenance pruning is recommended when the primary objective is to maintain or improve tree

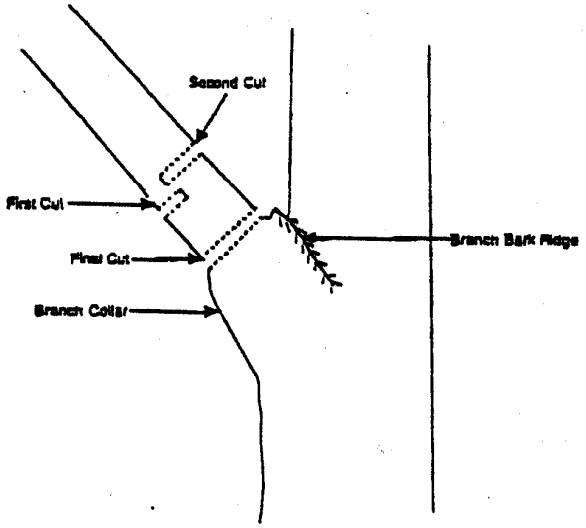


Figure 1 – Removing a large lateral branch requires two preliminary cuts before the final cut

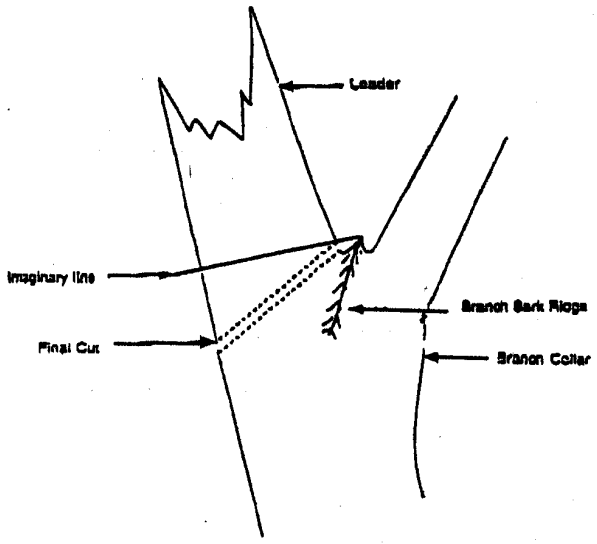


Figure 2 – When cutting back to a lateral, bisect the angle between the branch bark ridge and an imaginary line perpendicular to the leader or the branch being removed

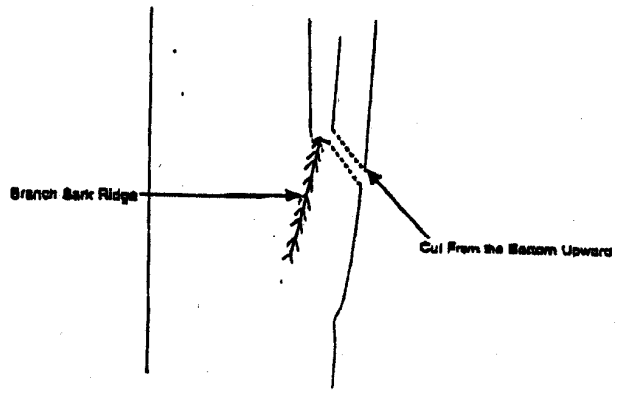


Figure 3 – When removing a branch with a narrow branch attachment, cut from the bottom upward

health and structure, and includes hazard reduction pruning. Maintenance pruning should consist of one or more of the following pruning types:

a) *Crown cleaning:* Crown cleaning shall consist of the selective removal of one or more of the following items: dead, dying, diseased, weak branches and watersprouts from a tree's crown;

b) *Crown thinning:* Crown thinning shall consist of the selective removal of branches to increase light penetration, air movement, and reduce weight;

c) *Crown raising:* Crown raising shall consist of the removal of the lower branches of a tree in order to provide clearance;

d) *Crown reduction (crown shaping):* Crown reduction reduces the height and/or spread of a tree. Consideration should be given to the ability of a species to sustain this type of pruning;

e) *Vista pruning:* Vista pruning is selective thinning of framework limbs or specific areas of the crown to allow a specific view of an object from a predetermined point;

f) *Crown restoration:* Crown restoration pruning should improve the structure, form, and appearance of trees that have been severely headed, vandalized, or storm damaged.

5.4 Young tree pruning

5.4.1 At planting

When a young tree is planted, dead, broken, and split branches should be removed. A central trunk or leader or well-spaced multiple trunks or leaders (as most appropriate for the species and specimen) should be developed by removing competing leaders and removing, heading, or thinning laterals on vigorously growing branches that compete with the selected leader(s). Branches should be retained on the lower trunk to increase taper.

5.4.2 During the first three years after planting

A strong scaffold branch structure should be developed by selecting the primary scaffold branches. To improve the scaffold structure, branches that are crossing, have included bark, or interfere with the scaffold branches should be removed. Scaffold branches should be properly spaced. For deciduous shade trees that will reach or exceed 40 ft (12 m) in height at maturity, the recommended spacing between primary scaffold branches is approximately 18 in (46 cm). For smaller species, 6 to 8 in (15 to 20 cm) would be adequate.

5.4.3 Between four and six years after planting

The development of a good, structurally sound scaffold branch system should be continued by selective thinning of or on branches and removing dead, interfering, split, and broken branches. Large-growing branches with narrow angles of attachment shall be removed from the trunk or canopy. Lower branches shall be pruned (crown raising) so as not to interfere with human needs where appropriate.

5.5 Specialty training systems

5.5.1 Espalier

Espalier pruning is a combination of cutting and training branches that are oriented in one plane; formally or informally arranged; and usually supported on a wall, fence, or trellis. The patterns can be simple or complex but the cutting and training is precise. Ties should be replaced every few years to prevent girdling the branches at the attachment site.

5.5.2 Pollarding

Pollarding is a training system used on some large-growing deciduous trees that are severely headed annually or every few years to hold them to modest size or to give them and the landscape a formal appearance. Pollarding is not synonymous with topping, lopping, or stubbing. Pollarding is severely heading some and removing the other vigorous water sprouts back to a definite head or knob of latent buds at the branch ends.

5.6 Palm pruning

5.6.1 Palm pruning should be performed when fronds, fruit, or loose petioles may create a dangerous condition.

5.6.1.1 Live healthy fronds, initiating at an angle of 45° or greater from the horizontal plane, should not be removed.

5.6.1.2 Fronds removed should be severed close to the petiole base without damaging living trunk tissue.

5.6.1.3 Palm peeling (shaving) should consist of the removal of the dead frond bases only, at the point they make contact with the trunk without damaging living trunk tissue.

5.7 Utility pruning

5.7.1 General

The purpose of utility pruning is to remove branches in order to prevent the loss of service, prevent damage to equipment, avoid impairment and uphold the intended usage of the facility/utility space.

5.7.1.1 Only a qualified line clearance tree trimmer or qualified line clearance tree trimmer trainee should be assigned to line clearance work in accordance with ANSI Z133.1, 29 CFR 1910.331 – 335, 29 CFR 1910.268, or 29 CFR 1910.269.

5.7.1.2 Utility pruning operations are exempt from requirements in 5.2.3.

5.7.2 Utility crown reduction pruning

5.7.2.1 Urban/residential environment

5.7.2.1.1 Cuts should be made in accordance with 5.2.5 and 5.2.6.

5.7.2.1.2 A minimum number of cuts should be made to accomplish the purpose of facility/utility pruning. The natural shape of the tree should be considered.

5.7.2.1.3 Trees directly under and growing into the facility/utility should be removed or pruned. Such pruning should be done by removing entire branches or by removing branches that have laterals growing into (or, once pruned, will grow into) the facility/utility space.

5.7.2.1.4 Trees growing along the side and growing into or toward the facility/utility space should be pruned by removing entire branches. Branches that, when cut, will produce sprouts that would grow into facilities and/or utility space should be removed.

5.7.2.1.5 Branches should be cut to laterals or the parent branch and not at a preestablished clearing limit.

5.7.2.2 Remote/rural environment

5.7.2.2.1 Climbing spurs

Climbing spurs may be used when limbs are more than throw line distance apart, or when the bark is thick enough to prevent damage to the cambium, or there are no other practical means of climbing the tree.

5.7.2.2.2 Remote locations

Utilities must often maintain facilities/corridors at remote locations. In such locations, it may be appropriate to use mechanical pruning equipment.

5.7.2.2.3 Mechanical pruning

Cuts should be made close to the main stem, outside of the branch bark ridge and branch collar. Precautions should be taken to avoid stripping or tearing of bark or excessive wounding.

5.7.3 Emergency service restoration

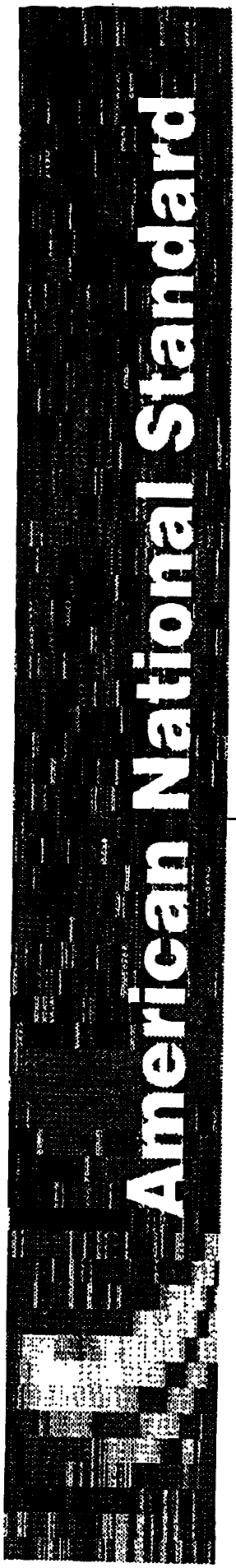
During a utility declared emergency, utilities must restore service as quickly as possible in accordance with ANSI Z133.1, 29 CFR 1910.331 – 335, 29 CFR 1910.268, or 29 CFR 1910.269. At such times it may be necessary, because of safety and the urgency of service restoration, to deviate from the use of proper pruning techniques as defined in this standard. Following the emergency, corrective pruning should be done as necessary.

Annex A
(informative)

Bibliography

Tree pruning guidelines, 1994[2)]

[2)] Available from the International Society of Arboriculture, 6 Dunlap Court, P.O. Box GG, Savoy, IL 61874.



for Tree Care Operations – Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements

ANSI Z133.1-1994

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New York, New York
10036

ANSI®
Z133.1-1994
Revision of
ANSI Z133.1-1988

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Secretariat
International Society of Arboriculture

Approved August 1, 1994
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Published by

American National Standards Institute
11 West 42nd Street, New York, New York 10036

Printed in the United States of America

APS18M1094/24

Contents

Foreword (This foreword is not part of American National Standard Z133.1-1994.)

This standard was developed under the procedures of the American National Standards Institute by Accredited Standards Committee on Safety in Tree Trimming Operations, Z133. The secretariat of the Z133 Committee is held by the International Society of Arboriculture.

Accredited Standards Committee Z133 was organized on April 4, 1968, in response to efforts by Mrs. Ethel M. Hugg of Johnstown, NY. Mrs. Hugg's son had died while trimming trees, and this tragic incident caused her to write to federal and state authorities, and to various safety organizations, in an attempt to have measures initiated that would make tree trimming safer.

The Z133 Committee was organized with the National Arborist Association as secretariat. Committee delegates included representatives of industry, labor, the academic community, government, equipment manufacturers, insurance carriers, and other interested experts. The International Shade Tree Conference became the secretariat of the committee in November 1969. In 1975, the International Shade Tree Conference was renamed the International Society of Arboriculture.

Five subcommittees were formed to develop specific portions of the original standard. Each subcommittee prepared and edited material in its area of concern; the material was then combined and submitted to the full committee for review. One of the subcommittees also met with representatives of the Occupational Safety and Health Administration, U.S. Department of Labor.

An initial draft was submitted for committee ballot on March 2, 1971. A revised draft was unanimously adopted by the committee on July 14, 1971, and was approved as an American National Standard on December 20, 1972.

The Z133 Committee continued to monitor tree-trimming safety performance, providing interpretation and clarification of the intent of the requirements. Portions of the safety standard were adopted by the Occupational Safety and Health Administration under the "Telecommunications" Safety and Health Standard 29CFR Part 1910 – *Federal Register*, Volume 38, No. 166, August 28, 1973.

Based on the experience of users, minor amendments to the standard were approved on November 17, 1975. The need for additional revision became evident and the committee, after considerable effort, discussion, consideration, and balloting unanimously approved the first revision on June 19, 1978. On May 17, 1979, the first revision was approved and printed for distribution as an American National Standard.

To clarify and acknowledge additional changes to the standard, the committee initiated consideration of other revisions at three meetings held March 25, 1981, October 5, 1981, and March 24, 1982, at the U.S. Department of Labor Building, Washington, DC. After proper discussion and balloting, the committee approved the second revision on March 24, 1982. On August 23, 1982, the second revision was approved as an American National Standard.

In July 1987, the committee voted to adopt several changes in the 1982 standard. These changes were made owing to increased technology and understanding of safe working practices related to tree care. The committee approved the final content and editorial changes on September 16, 1987. The standard was approved by the American National Standards Institute on November 23, 1987.

The 1994 revision incorporates changes based on increased technology and understanding of safe working practices related to tree care as well as the OSHA 1910.269 standard released in January 1994. The committee approved the final content and editorial changes on April 27, 1994. The standard was approved by the American National Standards Institute on August 1, 1994.

The Z133 Committee will continue to be available for interpretation or clarification of the intent of the requirements in the standard and for any adjustments or revisions of the standard.

There are four annexes in this standard. All four are informative and not considered part of this standard.

Suggestions for improvement of this standard will be welcome. They should be sent to the International Society of Arboriculture, P.O. Box GG, 6 Dunlap Ct., Savoy, IL 61874.

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Safety in Tree Trimming Operations, Z133. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the Z133 Committee had the following members:

Gerald Duke, Chair
Robert Felix, Vice-Chair
William P. Kruidenier, Secretary
Marion Feller, Recording Secretary

Organization Represented	*Name of Representative*
ACRT, Inc.	Richard Abbott
	Jeff Saltzman (Alt.)
American Association of Nurserymen	Craig Regelbrugge
American Insurance Association	George Klinger
Asplundh Tree Expert Company	James Allard
California Arborist Association	Don Blair
The F.A. Bartlett Tree Expert Company	Patrick Flynn
The Davey Tree Expert Company	Edward J. Johnson
Edison Electric Institute	Thomas O'Rourke
	M. C. Mingoia (Alt.)
	Herschel C. Hale (Alt.)
International Brotherhood of Electrical Workers	Stanley Hubbard
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International Society of Arboriculture	David C. Shaw
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National Arborist Association	Robert Felix
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Pacific Coast Electric Association	Steven Alvarez
Sacramento Municipal Utility District	Jim Sweeney
Southeastern Public Service Corporation	Don Baetge
U.S. Department of Interior	J. Daniel Sullivan, Sr.
U.S. Department of Labor	David Wallis
	Chap Pierce (Alt.)
U.S. Forest Service	Marcia Snead
	Robert F. Wilson (Alt.)
Utility Arborist Association	Thomas D. Mayer
	S. Dale Crutchfield (Alt.)
Honorary Members	Mrs. Ethel Hugg
	Gordon S. King
	Robert Herder

Individual Members
H. Dennis P. Ryan III
Vincent D. Morabit
Mark Tobin

American National Standard for Tree Care Operations –

Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements

1 Scope, purpose, and application

1.1 Scope

This standard presents safety requirements for pruning, trimming, repairing, maintaining, and removing trees and for cutting brush, and for the use of equipment in such operations.

1.2 Purpose

The purpose of this standard is to provide safety criteria for workers and the public. It is intended as a guide to federal, state, and municipal authorities in the drafting of their regulations and may be adopted by them in whole or in part.

1.3 Application

This standard is intended to apply to any employer engaged in the business, trade, or performance of tree pruning, trimming, repairing, maintaining, removal, or brush cutting who hires one or more persons to perform such work. It is also intended, through voluntary use, as a standard reference for safety requirements for those engaged in pruning, trimming, repairing, maintaining, or removing trees or cutting brush.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

Because of the many specialized operations utilized during professional tree care operations, it must be emphasized that exceptions to provisions of these standards may be acceptable and may require a flexible and/or applicability judgment decision for these professional operations.

ANSI A10.14-1991, *Requirements for safety belts, harnesses, lanyards, lifelines, and drop lines for construction and industrial use*

ANSI A14.1-1982, *Ladders – Portable wood – Safety requirements*

ANSI A14.2-1990, *Ladders – Portable metal – Safety requirements*

ANSI A1264.1-1989, *Safety requirements for workplace floor and wall openings, stairs and railing systems*

ANSI B175.1-1991, *Power tools – Gasoline-powered chain saws – Safety requirements*

ANSI Z87.1-1989, *Practice for occupational and educational eye and face protection*

ANSI Z88.2-1992, *Practices for respiratory protection*

ANSI Z89.1-1986, *Personnel protection – Protective headware for industrial workers – Requirements*

ANSI/SIA A92.2-1990, *Vehicle-mounted elevating and rotating aerial devices*

Title 29, part 1910, subpart I [1)]

[1)] Available from U.S. Department of Labor, OSHA, 200 Constitution Avenue, NW, Washington, DC 20201.

29 CFR 1910.269, *Electric power generation, transmission, and distribution*[1)]

Cordage Institute specifications[2)]

3 Definitions

3.1 approved: Acceptable to the federal, state, or local enforcing authority having jurisdiction.

3.2 competent person: One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

3.3 drop started: The act of starting a chain saw by pushing the saw away from the body with one hand while simultaneously pulling on the starter cord handle with the other.

3.4 electrical conductor: Any overhead or underground electrical device, including communications wires and cables, power lines, and other such facilities.

3.5 electrical hazard: An electrical hazard exists when a worker, a tool, or any conductive object is closer than 10 ft (3.05 m) from an energized overhead conductor rated 50 kV, phase-to-phase or less, or closer than 10 ft + 4/10 in (3.05 m + 10 mm) for each kilovolt over 50 kV. When an electrical hazard exists, minimum clearances shall be maintained and only qualified line-clearance tree trimmers or qualified line-clearance tree trimmer trainees shall perform the work.

3.6 false crotch for a climbing line: A 5/8-in shackle (clevis) with a minimum breaking strength of 5000 lb (22.2 kN) supported by a line equal to the minimum requirements of a climbing line. The pin in the shackle (clevis) shall be secured in a positive manner (by safety wiring the pin in place or securing the pin in place with a cotter pin). In place of a shackle, a 1/2-in rope pulley with a minimum breaking strength of 5000 lb (22.2 kN) may be used.

3.7 improved crotch: Any tight or V-shaped tree crotch that has been altered so as to allow the climbing line to move freely.

3.8 leg protection: Garment designed to provide protection to the legs during chain saw operations.

3.9 line-clearance tree trimming: The pruning, trimming, or removal of trees or brush growing or existing in proximity to electrical conductors (as defined above) for the purpose of preventing such growth from interfering with the facilities involved.

3.10 personnel lanyard (buck strap, flip line): A short line or strap designed as a climbing aid.

3.11 proximity: Within 10 ft (3.05 m) of energized overhead conductors rated 50 kV phase-to-phase or less; for overhead conductors rated over 50 kV phase-to-phase, the minimum clearance shall be 10 ft + 4/10 in (3.05 m + 10 mm).

3.12 prusik knot: Sliding friction knot tied by passing one end of a prusik loop around a standing line (such as a climbing line placed in a tree) and through the other end of the loop two or three times. The knot or splice used to form the prusik loop should be kept out of the knot. The free end of the loop is pulled to form and tighten the knot.

3.13 prusik loop: Endless loop of rope that meets the minimum strength criteria for a climbing line. It may be spliced to form an endless loop or tied with a suitable knot.

3.14 qualified person: One who, by possession of a recognized degree, certificate, or professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems relating to the subject matter, the work, or the project.

3.15 qualified line-clearance tree trimmer: A tree worker who, through related training and on-the-job experience, is familiar with the hazards in line clearance and has demonstrated his/her ability in the performance of the special techniques involved. This qualified person may or may not be currently employed by a line-clearance contractor.

3.16 qualified line-clearance tree trimmer trainee: Any worker undergoing line-clearance tree-trimming training, who, in the course of such training, is familiar with the hazards in line clearance and has demonstrated ability in

2) Available from the Cordage Institute, 350 Lincoln Street, Hingham, MA 02043.

the performance of the special techniques involved. Such trainees shall be under the direct supervision of qualified personnel.

3.17 qualified personnel: Any worker who by reason of training and experience has demonstrated the ability to perform duties safely and, where required, is properly licensed in accordance with federal, state, or local laws and regulations.

3.18 qualified tree worker: A worker who, through related training and on-the-job experience, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees, with the equipment used in such operations, and has demonstrated ability in the performance of the special techniques involved.

3.19 qualified tree worker trainee: Any worker undergoing on-the-job training who, in the course of such training, is familiar with the hazards of pruning, trimming, repairing, maintaining, or removing trees, and with the equipment used in such operations, and has demonstrated ability in the performance of the special techniques involved. Such trainees shall be under the direct supervision of qualified personnel.

3.20 shall: As used in this standard, denotes a mandatory requirement.

3.21 should: As used in this standard, denotes an advisory recommendation.

3.22 system operator/owner: The person or organization that operates or controls the electrical conductors involved.

3.23 taut-line hitch: A hitch used for securing all workers aloft to their climbing line, and consisting of either one or two wraps over two wraps. All wraps should go in the same direction. This standard does not exclude the use of a prusik loop or a mechanical ascender in lieu of a taut-line hitch.

3.24 tied in: The term that describes a tree climber whose climbing line has been properly crotched and attached to the saddle and whose taut-line hitch is tied.

3.25 tool lanyard: Short line or strap used to secure a tool while working aloft.

NOTE – A glossary of additional terms is given in annex A.

4 General safety requirements

4.1 General

4.1.1 Equipment and devices shall conform with the requirements of this standard and shall be properly maintained.

4.1.2 Employers shall instruct their employees in the proper use of all equipment provided for them and shall require that safe working practices be followed. A job briefing, work procedure, and assignment shall be worked out carefully before any tree job is begun.

4.1.3 All equipment, including ropes and lines, upon which the worker must rely for safety, shall be inspected and properly maintained by the worker each day before use.

4.2 Personal protective equipment

4.2.1 Personal protective equipment as outlined in 4.2 shall be required where there is a reasonable probability of injury or illness that can be prevented by such protection.

4.2.2 Head protection shall be worn by workers engaged in tree operations. It shall conform to the applicable provisions of ANSI Z89.1. Class B helmets shall be worn when working in proximity to an electrical conductor, in accordance with ANSI Z89.1. The tree worker shall not place reliance on the dielectric capabilities of such helmets.

4.2.3 Respiratory protection when required shall conform to the applicable provisions of ANSI Z88.2.

4.2.4 Eye and face protection when required shall comply to applicable provisions of ANSI Z87.1.

4.2.5 Employees shall wear clothing and footwear as approved by employer appropriate to the work location and condition.

4.2.6 Leg protection should be worn while operating a chainsaw during ground operations.

4.2.7 Tree climber's saddles as specified in ANSI A10.14 shall be worn to protect climbers above ground level.

4.2.8 Tree climbing saddles shall have dropped forged support dee rings. Additional support can be provided with dee rings on the waist for use with a lanyard. Snaps used in

climbing shall be the self-closing type with a minimum breaking strength of 5000 lb.

4.2.9 Carabiners shall not be used to tie the climbing line into the saddle, unless the carabiner meets the minimum standards for rope snaps, and is designed such that it cannot unintentionally be opened during work operations.

4.2.10 Climbing lines shall have a minimum diameter of 1/2 in (12 mm) and be constructed of a synthetic fiber, with a minimum nominal breaking strength of 5400 lb (24 kN) when new or of equivalent or greater strength and durability. Maximum working elongation (elasticity) shall not exceed 7 percent at a load of 540 lb (10 percent minimum breaking strength). Climbing lines shall be identified by the manufacturer as suitable for tree climbing. Prusik loops and lanyards shall meet the minimum strength standards established for climbing lines. Climbing lines shall not be spliced to effect repair.

4.2.11 Tree climbing saddles and lanyards shall not be weakened by punching extra holes in them. All rope splicing shall be in accordance with Cordage Institute specifications.

NOTE – The Cordage Institute specifications that are necessary for this requirement are determined by the size of the rope being used. Contact the rope manufacturer for more specific information.

4.2.12 Climbing lines, lanyards, or prusik loops shall not be used to lower limbs or other parts of trees.

4.3 First aid and rescue procedures

4.3.1 A physician-approved first-aid kit adequately stocked and maintained shall be provided by the employer when and where operations are being carried on. Each employee shall be instructed in its use.

4.3.2 All employees shall be instructed in identification of, and preventive measures relating to, common poisonous plants such as poison ivy, poison oak, and poison sumac.

4.3.3 Aerial rescue procedures for employees working above ground, shall be established by the employer, and the employees trained accordingly. Under emergency conditions, any reasonable method of rescue may be used.

4.3.4 Employees should be instructed in cardiopulmonary resuscitation (CPR) and first aid.

4.4 Traffic control

4.4.1 Effective means for control of pedestrian and vehicular traffic shall be instituted on every job site where necessary following U.S. Department of Transportation (DOT) Standards and Guidelines Work Zone Traffic Controls, or applicable state/local laws and regulations.

4.4.2 Traffic-control devices used in tree operations shall conform to the applicable federal and state regulations.

4.5 Fire protection

4.5.1 Gasoline-powered equipment shall be refueled only after the engine has been stopped. Any spilled fuel shall be removed from the equipment before restarting.

4.5.2 Gasoline-powered equipment shall not be operated within 10 ft (3.05 m) of any refueling operation or any area in which refueling has recently taken place.

4.5.3 Flammable liquids shall be stored, handled, and dispensed only from approved safety containers.

4.5.4 Smoking shall be prohibited when handling or working around any flammable liquid.

4.5.5 Workers wearing clothing on which flammable liquid has been spilled shall avoid open flame and other sources of ignition, and change the contaminated clothing as soon as possible.

4.6 Noise

When employees are assigned to work in areas in which noise levels exceed acceptable standards, as established by federal regulations, the employer should take appropriate measures to suppress noise levels. When it is not practicable to decrease the noise or isolate the workers from it, the workers shall wear effective hearing-protective equipment as provided by the employer.

5 Electrical hazards

5.1 General

All overhead and underground electrical conductors and all communication wires and

cables shall be considered to be energized with potentially fatal voltages.

5.1.1 Every treeworker shall be instructed that

- a direct contact is made when any part of the body touches or contacts an energized conductor or other energized electrical fixture or apparatus;
- an indirect contact is made when any part of the body touches any object in contact with an energized electrical conductor or other energized fixture or apparatus;
- an indirect contact can be made through conductive tools, tree branches, trucks, equipment, or other conductive objects, or as a result of communication wires and cables, fences, or guy wires being accidentally energized;
- electric shock will occur when a tree worker, by either direct or indirect contact with an energized conductor, energized tree limb, tool, equipment, or other object, provides a path for the flow of electricity to a grounded object or to the ground itself. Simultaneous contact with two energized conductors will also cause electric shock that may result in serious or fatal injury.

5.1.2 The system operator/owner shall be advised before any work is performed in proximity to energized conductors. This rule shall not apply to persons working on behalf of, or employed by, the system operator/owner.

5.2 Working in proximity to electrical hazards

5.2.1 An inspection shall be made by a qualified tree worker to determine whether an electrical hazard exists before climbing, or otherwise entering, or performing any work in the tree.

5.2.2 Only a qualified line-clearance tree trimmer or qualified line-clearance tree trimmer trainee shall be assigned to the work if it is found that an electrical hazard exists. A trainee shall be under the direct supervision of a qualified line-clearance tree trimmer.

5.2.3 There shall be a second qualified line-clearance tree trimmer or line-clearance tree trimmer trainee within vision or voice communication during line-clearing operations aloft when the line-clearance tree trimmer or line-clearance tree trimmer trainee must approach more closely than 10 ft (3.05 m) to any conductor or electrical apparatus energized in excess of 750 V or when

- branches or limbs being removed cannot first be cut (with a pole pruner/pole saw) sufficiently clear of the conductors and apparatus so as to avoid contact;
- roping is required to remove branches or limbs from such conductors or apparatus.

This does not apply to utility workers engaged in tree trimming incidental to their normal occupation.

5.2.4 Line-clearance tree trimmers and line-clearance tree-trimmer trainees shall maintain the clearances from energized conductors given in table 1.

5.2.5 All other tree workers shall maintain a minimum clearance of 10 ft (3.05 m) from energized conductors rated 50 kV phase-to-phase or less; for conductors rated over 50 kV phase-to-phase, the minimum clearance shall be 10 ft + 4/10 in (3.05 m + 10 mm) for each kilovolt over 50 kV.

5.2.6 Branches hanging on a conductor may be removed using nonconductive equipment.

5.2.7 Footwear, including those having electrical-resistant soles and lineman's overshoes, shall not be considered as providing any measure of safety from electrical hazards.

5.2.8 Rubber gloves, with or without leather or other protective covering, shall not be considered as providing any measure of safety from electrical hazards.

5.2.9 Ladders, platforms, and aerial devices, including insulated aerial devices, shall be subject to the working requirements in tables 1 and 2.

5.2.10 If an aerial lift device contacts an electrical conductor, the aerial device and attached equipment (such as a chipper) shall be considered as energized, and contact with the truck shall be avoided except where emergency rescue procedures are being carried out. Emergency rescue should only be performed by trained persons familiar with electrical hazards.

Table 1 – Minimum working distances from energized conductors for qualified line-clearance tree trimmers and qualified line-clearance tree trimmer trainees

Nominal voltage kV phase-to-phase	Includes 1910.269 elevation factor, sea level to 5000 ft[1)]		Includes 1910.269 elevation factor, 5001–10,000 ft[1)]		Includes 1910.269 elevation factor, 10,001–14,000 ft[1)]	
	ft-in	m	ft-in	m	ft-in	m
0.05 – 1.0	Avoid contact		Avoid contact		Avoid contact	
1.1 – 15.0	2-04	0.71	2-08	0.81	2-10	0.86
15.1 – 36.0	2-09	0.84	3-02	0.97	3-05	1.04
36.1 – 46.0	3-00	0.92	3-05	1.04	3-09	1.14
46.1 – 72.5	3-09	1.14	4-03	1.30	4-07	1.40
72.6 – 121.0	4-06	1.37	5-02	1.58	5-07	1.70
138.0 – 145.0	5-02	1.58	5-11	1.80	6-05	1.96
161.0 – 169.0	6-00	1.83	6-10	2.08	7-05	2.26
230.0 – 242.0	7-11	2.41	9-00	2.75	9-09	2.97
345.0 – 362.0	13-02	4.02	15-00	4.58	16-03	4.96
500.0 – 550.0	19-00	5.80	21-09	6.63	23-06	7.17
765.0 – 800.0	27-04	8.34	31-03	9.53	33-10	10.32

[1)] Exceeds phase-to-ground; elevation factor per 29 CFR 1910.269.

Table 2 – Minimum approach distances to energized conductors for persons other than qualified line-clearance tree trimmers and qualified line-clearance tree trimmer trainees

Nominal voltage kV phase-to-phase[1)]	Distance	
	ft-in	m
0.0 – 1.0	10-00	3.05
1.1 – 15.0	10-00	3.05
15.1 – 36.0	10-00	3.05
36.1 – 50.0	10-00	3.05
50.1 – 72.5	10-09	3.28
72.6 – 121.0	12-04	3.76
138.0 – 145.0	13-02	4.00
161.0 – 169.0	14-00	4.24
230.0 – 242.0	16-05	4.97
345.0 – 362.0	20-05	6.17
500.0 – 550.0	26-08	8.05
765.0 – 800.0	35-00	10.55

[1)] Exceeds phase-to-ground.

5.3 Storm work and emergency conditions

5.3.1 Storm work and emergency conditions create special hazards; only authorized representatives of the system operator/owner shall perform tree work under such conditions.

5.3.2 When, during tree operations, an emergency condition develops that involves electrical conductors, work shall be suspended and the system operator/owner shall be notified immediately.

6 Mobile equipment

6.1 General

6.1.1 All vehicles and equipment, regardless of type, should be equipped and operated in accordance with manufacturer's operating instructions.

6.1.2 Seat belts should be worn by all occupants when a vehicle so equipped is in motion.

6.1.3 Equipment shall be turned off, keys removed, and rotating parts at rest when repairs or adjustments are made, except where manufacturer's procedures require otherwise. All defects or malfunctions affecting the safe operation of any equipment shall be corrected before placing such equipment into use.

6.1.4 Trucks with obscured rear vision, particularly those with trailed vehicles, should be backed up only when absolutely necessary and then should have outside, rear guidance, when available.

6.1.5 Equipment shall be operated by qualified personnel.

6.1.6 All material and equipment carried on the vehicles shall be stored so as to prevent it from falling off the truck or injuring occupants during transit.

6.1.7 Workers shall not be permitted to ride outside, or on top of the vehicle, unless they are riding in a designated place or places required by the nature of the operation, such as roadside spraying.

6.1.8 No hoisting or lifting equipment shall be used to lift more than its rated capacity as stated by the manufacturer's specifications.

6.1.9 Pads shall be set under outrigger feet when they are put on a soft or unstable surface. Traction for outrigger feet shall be ensured when ice or snow is present. Operator shall ensure that outriggers are set on stable footing which may require the use of pads. Operator shall ensure there is adequate clearance and warning prior to lowering outriggers.

6.1.10 The manufacturer's instructions should be followed in detecting hydraulic leaks. Workers shall not attempt to locate hydraulic leaks by feeling for them with their hands.

6.1.11 All step surfaces on equipment shall be skid-resistant.

6.1.12 The manufacturer's preventative maintenance and parts-replacement procedures should be followed.

6.1.13 Ignition keys shall be removed when the vehicle or equipment is left unattended.

6.2 Aerial devices

6.2.1 Prior to the daily use of an aerial device, a visual inspection and operational check shall be made in accordance with the manufacturer's and owner's instructions. Manufacturer's instructions shall be available to the operator. A guideline for inspection should be available.

6.2.2 Buckets, platforms, or booms of aerial device equipment shall be provided with some means of anchorage to which a body belt lanyard can be secured. When aloft, the operator shall be secured with a body belt and personnel lanyard.

6.2.3 The combined load, including workers, material, and tools, shall not exceed the rated lift capacity as stated by the manufacturer. Such rated lift capacity (load rating) shall be conspicuously and permanently posted on the lift in accordance with ANSI/SIA A92.2.

6.2.4 An aerial device or aerial ladder shall not be used as a crane or hoist to lift or lower materials, unless specifically designed to perform such operations by the manufacturer.

6.2.5 Wheel chocks shall be installed before using an aerial device, unless the device has no wheels on the ground.

6.2.6 When hydraulic/pneumatic tools are being serviced or adjusted, they shall be disconnected, except where manufacturer's procedures require otherwise.

6.2.7 When operating an aerial device, the operator shall look in the direction of travel of the bucket and be aware of the booms in relation to all other objects and hazards.

6.2.8 When booms or buckets are operated over roads, clearances from passing vehicles shall be maintained or traffic control shall be provided.

6.2.9 A one-person bucket shall not have more than one person riding in it during work operations.

6.2.10 Except where quick-acting connectors are used, pressure shall be released before connections are broken to avoid the hazards of flying particles or the whipping of hydraulic or pneumatic hoses. Hydraulic or pneumatic hoses shall never be kinked in order to cut off pressure prior to disconnecting.

6.2.11 No part of the body shall be used to either locate or attempt to stop a hydraulic leak.

6.2.12 All hoses affecting the dielectric characteristics of equipment shall meet manufacturer's requirements. Flash point of hydraulic fluid shall meet the minimum set by manufacturer.

6.2.13 Booms or buckets shall not be run into conductors, cables, poles, trees, and similar objects.

6.2.14 When working in proximity to energized, overhead conductors, electric cables (as for an electric saw), lights, or other conductive material shall not be run from the truck to the bucket on insulated equipment.

6.2.15 An aerial device truck shall not be moved when the boom is elevated in a working position with an operator in the bucket, except for equipment that is specifically designed for this type of operation. The booms of a fully articulated aerial device shall not be considered elevated in a working position when the bucket is "landed" directly in front of or behind the truck with the booms held as low as feasible and low enough so that the operator's head is below the highest point of the vehicle.

6.2.16 Holes shall not be drilled in the bucket or liner that would reduce dielectric integrity.

6.2.17 During aerial device operations, tree workers not engaged in line-clearance shall maintain a minimum clearance of 10 ft (3.05 m) from energized conductors rated 50 kV phase-to-phase or less; for lines rated over 50 kV phase-to-phase, the minimum clearance shall be 10 ft + 4/10 in (3.05 m + 10 mm) for each kilovolt over 50 kV phase-to-phase. Qualified line-clearance tree trimmers or qualified line-clearance tree-trimmer trainees using an insulated aerial bucket may operate in accordance with the clearances given in table 1910.269 in 29 CFR 1910.269.

6.2.18 Workers shall be instructed that insulated buckets do not protect them from other electric paths to the ground, such as those through trees, through a guy wire, or the path from one phase wire to the second phase wire, any one of which can be fatal.

6.3 Brush chippers

6.3.1 Access panels for maintenance and adjustment shall be closed and secured prior to operation of brush chippers.

6.3.2 A rotary drum or disc brush chipper not equipped with a mechanical infeed system shall be equipped with an infeed hopper not less than 85 in (2.15 m), measured from the blades or knives to ground level over the centerline of the hopper, and shall have sufficient height on its side members so as to prevent personnel from contacting the blades or knives of the machine during operations.

6.3.3 A rotary drum or disc brush chipper not equipped with a mechanical infeed system shall have a flexible antikickback device installed in the infeed hopper to reduce the risk of injury from flying chips and debris.

6.3.4 A brush chipper equipped with a mechanical infeed system shall have a quick stop and reversing device on the infeed. The activating mechanism for the quick stop and reversing device shall be located across the top, along each side of, and close to the feed end of the infeed hopper within easy reach of the operator.

6.3.5 Trailer chippers detached from trucks shall be chocked or otherwise secured.

6.3.6 The operator and workers in the immediate area shall wear vision, hearing, or other personal protective equipment as required by the federal Occupational Safety and Health Administration (OSHA) in Title 29, part 1910, subpart I as well as requirements in 4.2.1.

6.3.7 When in tow position, the chipper safety chains shall be crossed under the tongue of the chipper and affixed securely to the towing vehicle.

6.4 Sprayers and related equipment

6.4.1 Working and walking surfaces of all sprayers and related equipment shall be covered with nonskid material.

6.4.2 Equipment on which workers stand and spray while the vehicle is in motion shall be equipped with guardrailing around the working area. The guardrailings shall be constructed in accordance with ANSI A1264.1.

6.5 Stump cutters

6.5.1 Stump cutters shall be equipped with enclosures or guards that will reduce the risk of injury to the operator.

6.5.2 The operator and workers in the immediate area shall wear vision, hearing, or other personal protective equipment as required by OSHA.

6.6 Trucks

6.6.1 A steel bulkhead or equivalent protection shall be provided to protect the occupants of vehicles from load shifts.

6.6.2 Logs or brush shall be securely loaded onto trucks in such a manner as not to obscure tail lights or brake lights and vision, or to overhang the sides.

6.6.3 In order to avoid the hazard of spontaneous combustion or the production of undesirable odors, wood chips should not be left in trucks for extended periods.

6.7 Log loaders, tree cranes, and related hoists

6.7.1 Tree cranes operated by qualified personnel shall be operated to maintain a minimum clearance of 10 ft (3.05 m) from energized overhead conductors rated 50 kV or less. The minimum clearance shall be 10 ft + 4/10 in (3.05 m + 10 mm) for each kilovolt over 50 kV; however, a nonconductive load line of a crane may be operated within the clearances set forth in tables 1 and 2.

6.7.2 A boom-angle indicator shall be provided on all cranes.

6.7.3 An operator of hoisting equipment shall remain at the controls while a load is suspended.

6.7.4 Riding the load line while it is under load is prohibited. However, a qualified tree worker may be hoisted into position utilizing the hook, provided that the worker is tied in with an approved type of climbing line and climbing saddle that is properly secured to the boom or line.

6.7.5 A daily visual inspection of wire ropes, gears, chain drives, and other parts shall be made by the operator, in accordance with the manufacturer's recommendations.

6.8 Off-road equipment and tracked vehicles

6.8.1 Vehicles shall not be operated at speeds that will endanger the driver, the workers, or traffic. Equipment shall be under control at all times and shall be kept in gear when descending grades.

6.8.2 Towing equipment for brushhogs and similar implements should be equipped with a deadman control. If a deadman control is not available, the operator shall disengage the power source to the rotary or cutter head before alighting.

6.9 Underground operations

The location of any underground utilities shall be determined before underground operations are begun.

7 Portable power hand tools

7.1 Portable electric power tools

7.1.1 Electrical tools (except those that are self-powered) shall never be used in trees near an energized electrical conductor where there is a possibility of the supply cord or tool

contacting the conductor, whether in an aerial device or not.

7.1.2 All portable electric hand tools shall

- be equipped with three-wire cord having the ground wire permanently connected to the tool frame and means for grounding the other end; or
- be of the double insulated type and permanently labeled as "Double Insulated"; or
- be connected to the power supply by means of an isolating transformer, or other isolated power supply.

7.1.3 Extension cords shall be maintained in safe condition. Exposed metal sockets shall not be used.

7.1.4 Tool operators shall use electric hand tools in accordance with the manufacturer's instructions.

7.1.5 Tool operators should

- prevent cords from becoming entangled, damaged, or cut by blades and bits;
- avoid laying an extension cord in water;
- support an electrical tool and its power supply cord by a line, independent of the worker when the tool is used aloft.

7.2 Gasoline-driven power saws

7.2.1 The manufacturer's operating and safety instructions should be followed unless modified by this standard.

7.2.2 Power saws weighing more than 15 lb (6.8 kg) (service weight) that are used in trees shall be supported by a separate line, except when used from an aerial-lift device.

Where there are no lateral branches on which to crotch a separate support line for power saws weighing over 15 lb (6.8 kg), a false crotch shall be used. A false crotch is one that can hold power-saw lines without slipping or coming untied.

7.2.3 The operator shall have secure footing when starting the saw. Power saws weighing less than 15 lb (6.8 kg) (service weight) may be drop started. Drop starting of saws over 15 lb (6.8 kg) is permitted outside of the bucket of an aerial device only after ensuring that the area below the device is clear of personnel.

7.2.4 The engine shall be started and operated only when all coworkers are clear of the saw.

7.2.5 The engine shall be stopped when power saws are being carried. The saw need not be stopped between cuts during consecutive felling, bucking, limbing, or cutting operations where there is secure footing. The chain shall not be moving and the operator's hand shall be off the throttle lever while operators move between work locations. One-person saws should be carried by the worker on the side with the guide bar of the saw pointed to the rear; two workers should carry a two-person saw.

7.2.6 The engine shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or motor, except where manufacturer's procedures require otherwise.

7.2.7 The saw muffler/spark arrester shall be maintained in good condition.

7.2.8 The saw should periodically be cleaned.

7.2.9 Because of the many specialized chain saw operations utilized during the "professional tree trimming process," it must be emphasized that exceptions to provisions of ANSI B175.1 are acceptable and may require a flexible and/or applicability judgment decision for this professional chain saw operation.

7.3 Backpack power units (for use in pruning, clearing, etc.)

7.3.1 The manufacturer's operating manual of instructions should be followed unless modified by this standard.

7.3.2 During operations, no one except the operator shall be within 10 ft (3.05 m) of the cutting head of a brush saw.

7.3.3 The power unit shall be equipped with a quick shutoff switch readily accessible to the operator.

7.3.4 The operator shall observe the position of all personnel while the unit is running.

7.3.5 The engine shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or engine, except where manufacturer's procedures require otherwise.

8 Hand tools

8.1 General

8.1.1 The correct tool shall be selected for the job.

8.1.2 Tools that have been made unsafe by damage or defect shall not be used.

8.1.3 When climbing a tree, workers shall not carry tools in their hands other than tools that are used to assist them in climbing, such as pole pruners or pole saws. Tools (other than ropes) shall not be thrown into a tree, or from worker to worker while in the tree.

8.1.4 A climbing line or handline should be used for raising and lowering tools. Tools should be raised or lowered in a manner so the cutting edge will not contact the rope.

8.1.5 Workers shall maintain a safe working distance from other workers when using hand tools.

8.1.6 Tools shall be properly stored or placed in plain sight out of the immediate work area when not in use.

8.2 Chopping tools – Axes, brush hooks, machetes, and others

8.2.1 Chopping tools that have loose or cracked heads or splintered handles shall not be used.

8.2.2 Chopping tools should not be used while working aloft.

8.2.3 Chopping tools shall be swung away from the feet, legs, and body, using the minimum power practical for control.

8.2.4 Chopping tools shall not be driven as wedges or used to drive metal wedges.

8.3 Pruners and saws

Pole pruners, pole saws, and other similar tools shall be equipped with wood or nonmetallic poles. The actuating cord shall be of nonconducting material (example: polypropylene line).

8.4 Injector tools for applying herbicides

8.4.1 The bit of injector tools shall be covered with a shield when not in use.

8.4.2 Injectors shall be laid flat on the ground when not in use.

8.4.3 The injector shall not be carried on the shoulders but shall be carried by the loop handle on the downhill side, with the bit properly shielded and facing to the rear.

8.4.4 The manufacturer's recommendations shall be used in handling chemical mixtures.

8.4.5 Workers shall have firm footing and shall clear all interfering limbs away before using the tool.

8.5 Grub hoes, mattocks, and picks

8.5.1 The blade eye shall be tight-fitting and wedged so that it cannot slide down the handle.

8.5.2 When swinging grub hoes, mattocks, and picks, the worker shall have a secure grip and firm footing and be clear of overhead hazards.

8.6 Cant hooks, cant dogs, peavies, tongs, and carrying bars

8.6.1 Hooks should be firmly set before applying pressure.

8.6.2 Tools with cracked, splintered, or weakened handles should not be used.

8.6.3 Workers shall be warned and shall be in the clear before logs are moved.

8.6.4 The points of hooks shall be at least 2 in (51 mm) long and shall be kept sharp.

8.6.5 Workers shall stand to the rear and uphill when rolling logs.

8.7 Wedges, chisels, and gouges

8.7.1 Wedges, chisels, and gouges shall be inspected for cracks and flaws before use.

8.7.2 Wedges and chisels shall be properly pointed and tempered. Tools with mushroomed heads shall not be used.

8.7.3 Only wood, plastic, or soft-metal wedges shall be used to stop pinching while operating power saws.

8.7.4 Wood-handled chisels should be protected with a ferrule on the striking end.

8.8 Hammers, mauls, and sledges

Wood, rubber, or high-impact plastic mauls, sledges, or hammers should be used when striking wood-handled chisels or gouges.

8.9 Ropes and climbing line

8.9.1 Rope made unsafe by damage or defect, or for any other reason, shall not be used.

8.9.2 Rope shall be stored away from all cutting edges and sharp tools. Corrosive chemicals, gas, and oil shall be kept away from rope.

8.9.3 When stored, rope shall be coiled and piled, or suspended, so that air can circulate through the coils.

8.9.4 Rope ends shall be secured to prevent raveling.

8.9.5 Safety snaps shall be rotated from one end of the rope to the other, as needed, and the worn end cut off.

8.10 Tackle blocks and pulleys

Tackle blocks and pulleys shall be inspected immediately before use and shall be condemned if defective.

8.11 Ladders

8.11.1 Ladders made of metal or other conductive material shall not be used where an electrical hazard exists. Only wood ladders (constructed in accordance with ANSI A14.1) or nonconductive ladders made of synthetic material equal to or exceeding the strength of wood ladders shall be used.

8.11.2 Metal ladders used where no electrical hazards exist shall conform to ANSI A14.2.

8.11.3 All ladders shall be inspected daily before use.

8.11.4 The attaching of cleats, metal points, and nonskid feet; lashing; or other effective means of securing the ladder shall be used if there is danger of its slipping.

8.11.5 Ladders shall be supported while in storage so they will not sag. Except when on mobile equipment, ladders should be stored under suitable cover, protected from the weather, and kept in a dry location away from excessive heat.

8.11.6 Ladders shall not be used as bridges or inclined planes to load or handle logs or other material.

9 Work procedures

9.1 Climbing

Tree workers shall be tied in with an approved climbing line and a tree climber's saddle when working above the ground. This does not necessarily apply to a worker ascending into a tree. Work may be performed while standing on a ladder, including the top rung, but only when the worker is tied in as required.

9.1.1 Prior to climbing operations, a visual inspection of the entire tree (including root collar) should be performed. During climbing operations, tree limbs should be inspected before weight is applied to them. The climber should not trust the capability of a dead branch to support the climber's weight. Dead branches should be removed on the way up, if possible. Hands and feet should be placed on separate limbs, if possible, maintaining three points of contact with the tree while climbing. While climbing, the worker should climb on the side of the tree that is away from electrical conductors, if possible. Climbers should have a minimum of two means of attachment available.

9.1.2 When the climbing distance is greater than 25 ft, (7.6 m), or is beyond the worker's physical capabilities, the worker should not climb, shin, body thrust, or footlock the line, without being tied in, belayed, using a lanyard or a prusik loop.

9.1.3 The climbing line should be passed around the trunk of the tree as high above the ground as possible using branches with a wide crotch to prevent any binding of the climbing line.

EXCEPTION: Palms and other trees with similar growth characteristics that will not allow a climbing rope to move freely.

The crotch selected for tying in should be directly above the work area, or as close to such a position as possible, but located in such a way that a slip or fall would swing the worker away from any electrical conductor. The rope should also be passed around the main leader or an upright branch, using the limb as a stop. Feet, hands, and ropes should be kept out of tight V-shaped crotches.

9.1.4 A false crotch can be used at the discretion of the climber in lieu of a natural crotch.

9.1.5 A figure-eight knot should be tied in the end of the rope. This will prevent pulling the rope accidentally through the taut-line hitch and possible serious injury from a fall.

9.1.6 The climbing line shall be crotched as soon as practicable after the worker is aloft and then a taut-line hitch shall be tied and checked.

9.1.7 The worker shall be tied in and remain tied in until the work is completed and the worker has returned to the ground. If it is necessary to recrotch the rope in the tree, the worker shall retie in or use the personnel lanyard before releasing the previous tie.

9.1.8 A climbing line shall never be left in a tree overnight.

9.1.9 The climber shall inspect his/her equipment for damage, cuts, abrasion, and/or deterioration before each use and shall remove it from service if signs of wear or damage are found.

9.1.10 During all tree-working operations above a height of 12 ft (3.65 m) that are not subject to the requirements of 5.2.3, there shall be a second person within vision or voice communication. That person should be trained in emergency procedures.

9.1.11 Climbing spurs shall have gaffs of the type and length suitable for the tree being climbed.

9.1.12 Palm frond skirts that have 3 years or more of growth shall be removed from the top down. The climber doing this work will be supported by a climbing line and a false crotch. The climber shall never attempt to remove skirts of 3 years or more by positioning himself/herself below the work areas while being supported by a lanyard.

9.1.13 Dry conditions and dead fronds present an extreme fire hazard. When dry conditions exist, no worker shall smoke while working in or near dead palm fronds. All chain saws shall have spark arresters in good working condition. Care should be taken to ensure that chipper exhaust systems do not present a fire hazard to dead fronds.

9.2 Pruning and trimming

9.2.1 Pole pruners and pole saws shall be hung securely in a vertical position to prevent dislodgement. Pole pruners or pole saws shall not be hung on utility wires or cables and shall not be left in the tree overnight. Pole saws and pole pruners shall be hung so that the sharp edge is away from the worker, if possible, and shall be removed when the climber leaves the tree.

9.2.2 A scabbard or sheath should be hooked to the climbing saddle to carry the handsaw when it is not in use.

9.2.3 Warnings, when necessary, shall be given by the worker in the tree before a limb is dropped. "Timber" or "heads up" are common terms used for this purpose.

9.2.4 A separate line should be attached to limbs that cannot be dropped safely or are too heavy to be controlled by hand. The line should be held by workers on the ground end of the rope. Use of the same crotch for both the climbing line and the work line shall not be permitted.

9.2.5 Cut branches shall not be left in trees overnight.

9.3 Cabling

9.3.1 Ground personnel should not stand under the tree when the cable is being installed.

9.3.2 Tools used for cabling, bark tracing, cavity work, etc., shall be carried in a bag or belt designed to hold tools and attached to a tool lanyard designed to hold a tool bag.

9.3.3 When a block and tackle or a hand winch are released, workers in the trees should be positioned off to one side in order to avoid injury in case of the cable system failure.

9.4 Topping/lowering limbs

9.4.1 Workers performing topping operations should inspect the trees to assure they can stand the strain of the lowering procedure. If not, some other means of lowering the branches should be provided.

9.4.2 If large limbs are lowered in sections, the worker in the tree should be above or to the side of the limb being lowered.

9.4.3 Guidelines, handlines, or taglines should be used when conditions warrant.

9.4.4 When making large cuts in single spar trees, both ends of the lanyard should be attached to a single point of attachment to prevent injury to the climber if the spar should split. The waist or side dees should not be used for this purpose.

9.5 Felling

9.5.1 Before beginning any felling operation, the worker shall carefully consider and incorporate appropriate action into the planning of the following:

- The tree and the surrounding area including other trees for anything that may cause a hazardous condition;
- The shape of the tree and the type of wood;
- The lean of the tree;
- Wind force and direction;
- Decayed or other weak spots throughout the tree. Be aware of additional hazards if these conditions exist in the hinge area;
- The location and the means to protect other persons, property, and all utility wires.

9.5.2 The work area shall be cleared to permit safe working conditions, and an escape route shall be planned before any cutting is started.

9.5.3 Each tree worker shall be instructed as to exactly what to do. All workers not directly involved in the operation shall be kept clear of the work area, where practicable beyond the length of the tree.

9.5.4 A notch and backcut shall be used in felling trees over 5 in (127 mm) in diameter, measured at breast height.

9.5.4.1 The depth or penetration of the notch shall be about one-third the diameter of the tree. A crack, decayed area, or other weakness should be avoided in the hinge area on either side of the notch cut, where practicable.

9.5.4.2 The notch should be a minimum of 45° to a total of 90° to ensure proper felling accuracy all the way to the ground.

9.5.4.3 The backcut shall be made higher than the point or apex of the notch to prevent kickback and shall avoid penetration into the predetermined hinge area.

9.5.5 Before commencing the backcut, an audible warning shall be given to those in the area. All personnel in the vicinity shall be out of range when the tree falls, and visual contact should be maintained with the tree until the tree is on the ground.

9.5.6 If there is danger that the trees being felled may fall in the wrong direction or damage property, wedges, block and tackle, rope, or wire cable (except where an electrical hazard exists) shall be used. All limbs shall be removed from trees to a height and width sufficient to allow the tree to fall clear of any wires and other objects in the vicinity. Refer to 9.4.

9.5.7 Special considerations in roping rotten, dead, split, or otherwise hazardous trees shall be taken because they may act or fall in an unexpected manner.

9.5.8 A planned escape route shall be prepared before felling any log or trunk. The escape preferable is 45° on either side of a line drawn opposite the intended direction of the fall. (The only person permitted in this area as the tree falls is the saw operator.)

9.6 Brush removal and chipping

9.6.1 Brush and logs should not be allowed to create a hazard at the work site.

9.6.2 All workers feeding brush into chippers shall wear personal protective equipment as required. See 4.2 of this standard.

9.6.3 Brush chippers should be fed from the side of the feed table centerline, and the operator shall immediately turn away from the feed table when the brush is taken into the rotor or feed rollers. Chippers should be fed from the curbside whenever practical.

9.6.4 The chipper chute shall not be raised or removed while any part of the machine is turning or moving. The chipper shall not be used unless a discharge chute is of sufficient length or design to prevent contact with the blade in place.

9.6.5 Foreign material, such as stones, nails, sweepings, etc., shall not be fed into the chipper.

9.6.6 Operators shall not wear loose clothing or gauntlet-type gloves while feeding the chipper.

9.7 Limbing and bucking

9.7.1 The tree worker should always attempt to operate the chain saw away from the vicinity of the legs or feet. Where possible, employ natural barriers such as limbs between the saw and operator while assuring proper balance. Proper feet and leg protection are highly recommended, where possible.

9.7.2 The tree worker should stand on the uphill side of the work.

9.7.3 Branches bent under tension shall be considered hazardous.

9.7.4 The tree worker should block the log to prevent rolling.

9.7.5 When bucking up trunks of trees, wedges should be used as necessary to prevent binding of the guide bar or chain.

9.7.6 A cant hook or peavey should be used as an aid in rolling logs over to complete bucking.

9.7.7 When more than one worker is working on a tree, each should be aware of the other's location and activity.

Annex A
(informative)

Glossary of additional terms for ANSI Z133.1

NOTE – The numbers that appear in parentheses after these terms are cross references to the clause or subclause in the text in which the term is used.

aerial devices (6.2): One of the following types of vehicle-mounted aerial devices used to elevate personnel to job sites above ground:

- Extensible boom platforms;
- Aerial ladders;
- Articulating boom platforms;
- Vertical towers;
- A combination of any of the above defined in ANSI A92.2.[3)]

backcut (9.5.4): The cut made in a tree limb or tree trunk on the side opposite the intended direction of fall.

brushhog (6.8.2): A heavy-duty rotary mower, normally pulled by a farm-type tractor, used for cutting and mulching brush.

bucket (6.2.2): A basket-type enclosure approximately 4 ft (1.22 m) high, which is attached to the end of the upper boom on an aerial lift providing a work platform for the operator who is working aloft.

bucking (7.2.5): The act of sawing a felled tree, limbs, or both, into smaller sections.

crotch (7.2.2): To pass a rope through the crotch of a limb, or false crotch, in such a way that the load will be supported by the main leader.

deadman control (6.8.2): A safety switch, electrical or mechanical, that deactivates the equipment's function when released by the operator.

dielectric (4.2.2): Nonconductive of electrical current.

drop started (7.2.3): The act of starting a chain saw by pushing the saw away from the body while simultaneously pulling on the starter handle.

false crotch for rigging (7.2.2): A pulley, block, sling, lashing, or metal ring, affixed to a tree's leader or limb, through which a load line is passed, to lower or raise limbs or equipment.

footlock (9.1.2): To climb up a suspended rope by pulling with the hands and arms and pushing upward with the feet. The loose end of the rope is wrapped under the middle and over the top of one foot, and is locked in place with pressure from the other foot. A prusik loop should be used by the climber when footlocking.

ground personnel (9.3.1): Worker or workers assigned to assist and carry out tree work activities on the ground.

guideline (handline, tagline) (9.4.3): Ropes used to provide guidance to the direction of fall during lowering operations.

handlines, taglines (groundlines) (9.4.3): Ropes used for lifting, lowering, or guiding limbs or equipment, or both, into or out of the tree.

kilovolts (5.2.5): The term for 1000 V, abbreviated as kV. Higher voltages are generally expressed in this unit, i.e., 12.5 kV (12,500 V) and 19.9 kV (19,900 V).

mushroomed (8.7.2): A condition that develops from constant hammering on the heads of the chisels and wedges that causes the metal to spread outward, fold under, and splinter off.

outrigger (6.1.9): Built-in device used to stabilize cranes, aerial lifts, and similar equipment.

phase (5.2.5): Any current-carrying conductor that has an electric potential other than ground.

phase-to-ground (tables 1 and 2): The electric potential (voltage) between a conductor and ground (assumed at 0 V).

[3)] The full titles for all referenced American National Standards are listed in clause 2.

phase-to-phase (5.2.5): The electric potential (voltage) between two conductors, each having its own electric potential reference ground.

primary conductor (5.2.3): Any conductor including aluminum, copper, or aluminum conductor steel reinforced (ACSR), bare, covered, or insulated, generally considered as above 750 V.

quick-acting connectors (6.2.10): Hose connectors in a hydraulic or pneumatic system designed to allow connection or disconnection without leakage when the system is pressurized.

shin (9.1.2): To climb by alternately shifting the grip of the arms and legs upward on the leader or on the limbs of the tree, or on both.

volts (5.1 and 5.2.5): A unit of electric potential difference between two points. Lower voltage systems are generally expressed in terms of volts, abbreviated V, i.e., 120 V, 240 V, and so on.

wheel chocks (6.2.5): Wedge-shaped blocks of wood or other material, placed in front of or in back of a vehicle's tires or tracks to prevent unintentional movement. If necessary, the chocks can be placed both in front and in back of the tires or tracks.

Annex B
(informative)

Recommended guidelines for standard performance and safety training for qualified line-clearance personnel

NOTE – The contents of this training outline are generic and may be customized to achieve equivalent levels of safe practice by substituting, or where deemed appropriate to the circumstances, omitting portions of this outline. Doing so, or determining not to use training aids that may be available, shall not be evidence of noncompliance with this standard or annex.

B.1 General requirements

B1.1 Introduction and employer/employee responsibilities

B1.1.1 Provide employee orientation to include:

- job description appropriate to job assignment;
- introduction to immediate supervision and crew members;
- familiarization with appropriate personal protective equipment and its proper use and maintenance;
- familiarization with equipment;
- introduction to company policies and procedures;
- safe work practices as related to job assignments.

B.1.1.2 Employee shall acknowledge in writing participation in employee orientation.

B.1.2 Line-clearance pruning and trimming techniques appropriate to job assignment

B.1.2.1 Provide education and training in accordance with prevailing national standards for utility pruning. Refer to recommended resources in annex D for further information.

B.1.2.2 Provide education and training in accordance with prevailing local, state or regional standards for utility pruning as well as those specified by utility contracts.

B.1.3 Tree knowledge for line-clearance purposes appropriate to job assignments

B.1.3.1 Provide education and training relative to predominant tree species within geographic area, such as identification, growth habits, structure, and wood strength.

B.1.3.2 Provide education and training for recognition and evaluation of potentially hazardous conditions related to tree structure. Refer to recommended resources in annex D.

B.2 General safety

B.2.1 OSHA standards

Familiarize employees with the requirements of federal and/or state OSHA standards as applicable to their job assignment. Refer to recommended resources in annex D.

B.2.2 American National Standards

Familiarize employees with the requirements in ANSI Z133.1 as applicable to their job assignment. Refer to recommended resources in annex D.

B.2.3 Public safety and traffic control

Provide education and training in the use of public safety and traffic control devices as applicable under federal, state, or local regulations.

B.2.4 Electrical hazards

Provide education and training in the recognition and avoidance of electrical hazards applicable to the employee's job assignment. Refer to recommended resources in annex D.

B.2.5 Emergency conditions

Provide education and training in the proper procedures for safely performing work in emergency conditions applicable to the employee's job assignment.

B.2.6 Job site briefings

Provide education and training in job-site-specific hazards associated with the job, work procedures involved, special precautions, and personal protective equipment requirements as applicable to the employee's job assignment.

B.3 Personal safety

B.3.1 Personal protective equipment

Provide personal protective equipment as required for applicable job assignments, and instruct the employee in its proper use and maintenance. Refer to recommended resources in annex D.

B.3.2 Emergency response procedures

Furnish employees with appropriate information and training required to expedite a response to a work site emergency, such as training in first aid, CPR, and aerial rescue methods.

B.3.3 Back and other accidental injury prevention

Provide education and training in the techniques required to avoid back and other accidental injuries applicable to job assignments.

B.3.4 Poison plant/animal identification and avoidance

Provide education and training in the identification and the need to avoid contact with poison plants and instructions for treating insect stings/bites, snake bites, etc.

B.4 Equipment safety

B.4.1 Mobile equipment and aerial lifts

Provide education and training in the inspection, operation, and maintenance of all vehicles and equipment. This would include equipment such as aerial lifts, brush chippers, stump grinders, log loaders, tree cranes, mowing equipment, and pesticide application equipment. All equipment shall comply with applicable federal and state regulations, local ordinances, and manufacturer's operating instructions. Such training to be appropriate to the employee's job assignment. Refer to annex D for recommended resources.

B.4.2 Aerial equipment and electrical hazards

Provide education and training so that employees understand the required and recommended procedures for operating aerial lifts in proximity to electrical hazards. Such training to be appropriate to the employee's job assignment. Refer to annex D for recommended resources.

B.4.3 Chain saw, power tool, and hand tool use and safety

Provide education and training in the use and safety of chain saws, power tools, and hand tools in accordance with manufacturer's instructions. Such training to be appropriate to the employee's job assignment. Refer to annex D for recommended resources.

B.4.4 Climbing equipment

Provide education and training in the inspection, maintenance, and storage of climbing equipment such as ropes, saddles, lanyards, carabiners, climbers, etc. Such training to be appropriate to the employee's job assignment.

B.5 Operational safety

B.5.1 Climbing techniques

Provide education and training in climbing techniques as appropriate to the employee's job assignment. Refer to annex D for recommended resources.

B.5.2 Rigging and tree removal

B.5.2.1 Provide education and training appropriate to the employee's job assignment in areas such as knots and ropes, rigging techniques, tree strength and weight characteristics, and potential electrical hazards.

B.5.2.2 Provide education and training in the identification and possible removal of dangerous trees. Such training shall be consistent with the requirements of the system owner/operator and appropriate to the employee's job assignment.

B.5.2.3 Provide education and training in the identification of hazardous trees, such training to be appropriate to the employee's job assignment.

B.5.3 Hazard communications

Provide education and training necessary to comply with federal regulations appropriate to the employee's job assignment.

B.5.4 Pesticide use

Provide education and training necessary to comply with federal regulations appropriate to the employee's job assignment.

Annex C
(informative)

General safety procedures that apply to all tree work

C.1 Lifting

Before lifting any weight, the tree worker should

a) be sure clear ground is available if the weight is to be carried from one place to another;

b) decide exactly how the object should be grasped to avoid sharp edges, slivers, splinters, or other things that might cause injury;

c) make a preliminary lift to be sure the load can be safely handled;

d) place feet solidly;

e) crouch as close to the load as possible with legs bent at an angle of about 90°;

f) keep back as straight as possible. It may be far from vertical but should not be arched;

g) lift with the legs, not the back;

h) use a second worker when necessary.

C.2 Load handling

Loads should be handled by the use of skids and winch equipment; cutting logs into shorter lengths should be considered.

C.3 Direct supervision

Direct supervision is when a qualified line-clearance tree trimmer or a qualified supervisor is present on the job site.

C.4 Federal regulations for noise levels

The acceptable noise levels as established by the Occupational Safety and Health Administration may be obtained by consulting 29 CFR 1910.95 (see annex D) or by contacting the following agency:

U.S. Department of Labor
OSHA – Noise Conservation Standards
200 Constitution Ave., NW
Washington, DC 20210

Annex D
(informative)

Available resources

D.1 Applicable American National Standards

- Z133.1, *Tree care operations, safety;*
- A300, *Standard practices for trees, shrubs and other woody plant maintenance* (publication pending);
- A10.14, *Requirements for safety belts, harnesses, lanyards, lifelines, and drop lines for construction and industrial use;*
- A14.1, *Ladders – Portable wood – Safety requirements;*
- A14.2, *Ladders – Portable metal – Safety requirements;*
- A92.2, *Vehicle-mounted elevating and rotating aerial devices;*
- B175.1, *Gasoline powered chain saws – Safety requirements;*
- Z87.1, *Practice for occupational and educational eye and face protection;*
- Z89.1, *Personnel protection – Protective headgear for industrial workers – Requirements.*

D.2 Applicable federal regulations[4)]

- U.S. Department of Labor – Occupational Safety and Health Administration:
  - CFR 29 1910.000, *General industry*
  - CFR 29 1910.67, *Vehicle-mounted elevating and rotating work platforms*
  - CFR 29 1910.95, *Occupational noise exposure*
  - CFR 29 1910.151, *Medical services and first aid*
  - CFR 29 1910.268, *Telecommunication*
  - CFR 29 1910.269, *Electric power generation, transmission, and distribution*
  - CFR 29 1910.331-335, *Safety – Electric related work practices*
  - CFR 29 1910.1200, *Hazard communication*
- 49 CFR (transportation regulations)

D.3 Training programs available from the National Arborist Association[5)]

- Video programs:
  - *Professional tree care safety:*
    - *General requirements;*
    - *Personal protection;*
    - *Equipment procedures;*
    - *Operational practices;*
    - *Electrical hazards and trees;*
    - *Aerial rescue;*
    - *Principles of pruning;*
    - *Pruning standards;*
    - *Chipper use and safety;*
    - *Back injury prevention program;*
    - *Chain saw selection and maintenance;*
    - *Chain saw use and safety;*
    - *Ropes, knots and climbing;*
    - *Tree wire contact/general electricity.*
- Written programs:
  - *Home study program in arboriculture* – Series I & II;

[4)] All available from the U.S. Department of Labor, OSHA, 200 Constitution Avenue, NW, Washington, DC 20201.

[5)] All available from National Arborist Association, P.O. Box 1094, Amherst, NH 03031.

- *Crewleader home study program*;
- *Tailgate safety*;
- *Electrical hazards awareness program*;
- *Hazard communication program.*

– Other publications:

- *The treeworker*;
- *Book of tree care standards*;
- *Hazardous tree quick check (manual and decals).*

D.4 Publications available from the International Society of Arboriculture[6]

- *Arborists' certification study guide*;
- *Tree climbers' manual*;
- *A handbook of hazard tree evaluation for utility arborists*;
- *Trees and overhead electric wires: proper pruning and selection*;
- *A photographic guide to the evaluation of hazard trees in urban areas* (2nd ed.);
- *Tree pruning guidelines*;
- *Tree health management: Evaluating trees for hazard video.*

D.5 Other publications

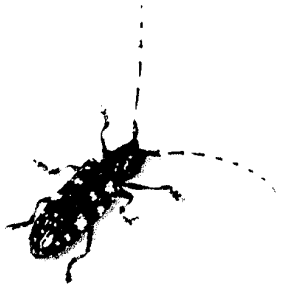
- *ACRT line clearance certification manual* (developed for use by Pennsylvania Electric Company)[7]
- *ACRT line clearance certification program* (developed for use by Pennsylvania Electric Company)[7]
- *Pruning trees near electric utility lines.*[8]

[6] All available from International Society of Arboriculture, P.O. Box GG, 6 Dunlap Court, Savoy, IL 61874.

[7] Available from ACRT, Inc., Utility Forestry Specialist, P.O. Box 219, 217 N. DePeyster Street, Kent, OH 44240-0219.

[8] Available from Shigo and Tree Associates, 4 Denbow Road, Durham, NH 03824.

Pest Alert



United States
Department of Agriculture

Forest Service

Animal and Plant
Health Inspection Service

NA-PR-01-99

Asian Longhorned Beetle *(Anoplophora glabripennis)*: A New Introduction

The Asian longhorned beetle (ALB) has been discovered attacking trees in the United States. Tunneling by beetle larvae girdles tree stems and branches. Repeated attacks lead to dieback of the tree crown and, eventually, death of the tree. ALB probably travelled to the United States inside solid wood packing material from China. The beetle has been intercepted at ports and found in warehouses throughout the United States.

The insect is a serious pest in China where it kills hardwood trees. In the United States the beetle prefers maple species (*Acer* spp.), including ***boxelder, Norway, red, silver, sugar*** and ***sycamore maples***. Other known hosts are ***horsechestnut, black locust, elms, birches, willows, poplars*** and ***green ash***. A complete list of host trees in the United States has not been determined. Currently, the only effective means to eliminate ALB is to remove infested trees and destroy them by chipping or burning. To prevent further spread of the insect, quarantines are established to avoid transporting infested trees and branches from the area. Early detection of infestations and rapid treatment response are crucial to successful eradication of the beetle.

General Information

There is probably one generation of ALB per year. Adult beetles are usually present from May to October, but can be found earlier in spring or later in fall if temperatures are warm. Adults usually stay on the trees from which they emerged or they may disperse short distances to a new host to feed and reproduce. Each female is capable of laying 30 to 70 eggs. The eggs hatch in 10-15 days and the larvae tunnel under the bark and into the wood where they eventually pupate. The adults emerge from pupation sites by boring a tunnel in the wood and creating a round exit hole in the tree.

For more information about Asian longhorned beetle in the United States, visit these U.S. Department of Agriculture web sites:

http://willow.ncfes.umn.edu/asianbeetle/beetle.htm

http://www.aphis.usda.gov/oa/alb/alb.html

If you suspect an Asian longhorned beetle infestation, please collect an adult beetle in a jar, place the jar in the freezer, and immediately notify any of these officials or offices in your State:

State Department of Agriculture:
- State Plant Regulatory Official
- State Entomologist

U.S. Department of Agriculture:
- Animal and Plant Health Inspection Service, Plant Protection and Quarantine
- Forest Service

County Extension Office

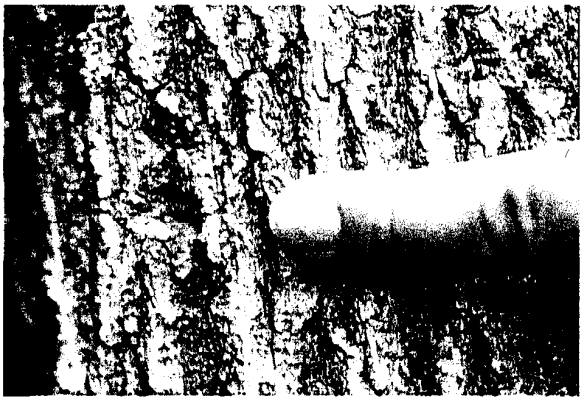
State Forester or Department of Natural Resources

or:

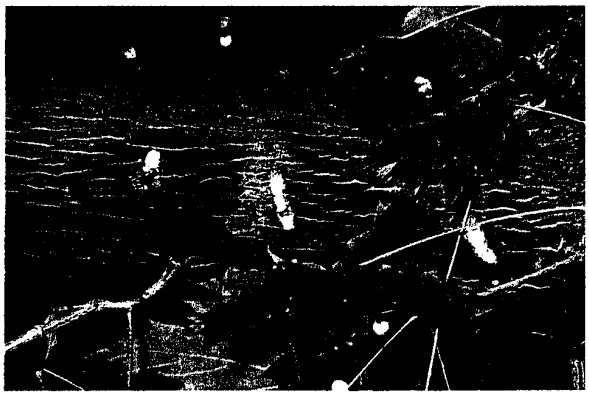
Asian Longhorned Beetle

WHAT TO LOOK FOR:

1. Adult beetles. Individuals are ¾ to 1¼ inches long, with jet black body and mottled white spots on the back. The long antennae are 1½ to 2½ times the body length with distinctive black and white bands on each segment. The feet have a bluish tinge.



2. Oval to round pits in the bark. These egg-laying sites or niches are chewed out by the female beetle, and a single egg is deposited in each niche.



3. Oozing sap. Sap may flow from egg niches, especially on maple trees, as the larvae feed inside the tree.

4. Accumulation of coarse sawdust around the base of infested trees, where branches meet the main stem, and where branches meet other branches. This sawdust is created by the beetle larvae as they bore into the main tree stem and branches.

5. Round holes, 3/8 inch in diameter or larger, on the trunk and on branches larger than 1½ inches in diameter. These exit holes are made by adult beetles as they emerge from the tree.

Photo Sources: USDA Forest Service
USDA Animal and Plant
Health Inspection Service

Prepared by: USDA Forest Service
Northeastern Area
State and Private Forestry, Radnor, PA

Parts of a Tree